Brief, Generic Descriptions of Catalog Items

Energy Supply Technical Working Group

(Recently enacted policies and programs in Washington State are listed where relevant. Note that this listing is incomplete and will be fleshed out during the TWG process; working group members are encouraged to provide input to the TWG facilitators on existing policies and programs, where relevant.)

Many aspects of Senate Bill 6001 (April 2007), *Mitigating the Impacts of Climate Change,* relate to the Energy Supply TWG catalog. The descriptions of items below indicate the relevant provisions and the bill can be viewed at: http://www.leg.wa.gov/pub/billinfo/2007-08/Pdf/Bills/Senate%20Passed%20Legislature/6001-S.PL.pdf.

ES-1 EMISSIONS POLICIES AND OVERARCHING ITEMS

1.1 GHG cap and trade

A cap-and-trade system is a market mechanism in which GHG emissions are limited or capped at a specified level, and capped entities can trade permits (a permit is an allowance to emit one ton of CO_2e). In principle, trading lowers the overall costs of meeting a given emission target, as participants with lower costs of compliance can choose to over-comply and sell their additional reductions to participants for whom compliance costs are higher.

Among the important considerations with respect to a cap-and-trade program are: the sources and sectors to which it would apply ("upstream" at the fuel extraction or import level vs. "downstream" at points of fuel consumption); whether electricity is dealt with from a load-based or generation-based perspective; the level and timing of the cap; how allowances would be distributed (e.g. via grandfathering and/or auctioning) and how new market entrants would be accommodated; what, if any, offsets would be allowed; over what region the program would be implemented (e.g., nationally, regionally, etc.); which GHGs are covered; whether price caps (e.g. safety valves) are included; whether there is linkage to other trading programs; whether banking and/or borrowing among time periods is allowed; early reduction credit; what, if any, incentive opportunities may be included; use of any revenue accrued from permit auctions; and provisions for encouraging energy efficiency, if relevant. An example of existing implementation of a GHG cap-and-trade system in the US is the Northeast States' Regional Greenhouse Gas Initiative: http://www.rggi.org/.

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> Policy features to consider include: generation vs. load-based emissions; upstream vs. downstream emissions; interactions with a potential federal program; allowance allocation; sectors covered; leakage; biomass GHG accounting; supporting RD&D; cap levels; legal requirements.

Recently enacted policies in Washington: In February 2007 Washington - along with California, Oregon, Arizona, New Mexico (and British Columbia, as of April 2007) - signed the Western Regional Climate Action Initiative.

"This collaboration shall include, but is not limited to:

- Setting an overall regional goal, within six months of the effective date of this initiative, to reduce emissions from our states collectively, consistent with state-by-state goals;
- Developing, within eighteen months of the effective date of this agreement, a design for a regional market-based multi-sector mechanism, such as a load-based cap and trade program, to achieve the regional GHG reduction goal; and
- Participating in a multi-state GHG registry to enable tracking, management, and crediting for entities that reduce GHG emissions, consistent with state GHG reporting mechanisms and requirements."

http://www.ecy.wa.gov/climatechange/docs/07Mar_WesternRegionalClimateActionInitiative.pdf

See also Senate Bill 6001 (April 2007), section 4a, (a weblink to SB6001 is included at the beginning of this document).

1.2 Carbon (GHG) tax

A carbon or GHG tax is be a tax on each ton of CO_2 or CO_2e emitted from an emissions source covered by the tax. A GHG tax could be imposed upstream based on carbon content of fuels (e.g. fossil fuel suppliers) or at the point of combustion and emission (e.g., typically large point sources such as power plants or refineries). Taxed entities may pass some or all of the cost on to consumers, change production to lower emissions, or a combination of the two. As the suppliers respond to the tax, consumers would see the implicit cost of GHG emissions in products and services, and could adjust their behavior to purchase substitute goods and services that result in lower GHG emissions. GHG tax revenue could be used in a number of ways from income tax reduction to policies and programs to support GHG reductions or technology innovation. GHG tax revenue could also be directed to helping the competitiveness of industries or assisting communities most affected by the tax. Carbon taxes have been in place in a number of European countries since the early 1990s.

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Consider impacts of taxes on different income groups; economic impacts; impact on investment in new technologies; which sectors will be included; use of revenue recycling to invest funds in improving energy efficiency.

1.3 Generation Performance Standards and/or Mitigation Requirements for Electricity

A generation performance standard (GPS) can take several forms. An emissions performance standard (as adopted recently in California) can require that load serving entities (LSE) to acquire electricity with an emission rate (e.g., X lbs CO_2/MWh) below a specified mandatory standard. This type of standard was adopted for WA in recently approved SB6001. Another type of standard holds power plant developers to build and operate new generation with emissions below a specified standard, an approach adopted in OR and WA. Finally, performance standards can be applied to existing power plants, as adopted in MA.

GHG offsets or fee payments can be used for compliance in comes cases, such as the OR and WA new power plant standards. GHG offsets are GHG emission savings from project-based activities in sectors or regions not covered by the standard or regulations, which typically need to meet specific criteria laid out in the regulation.

Recently enacted policies in Washington: In 2004, the Legislature passed HB 3141, establishing a policy requiring mitigation for 20 percent of the CO_2 emissions produced by a power plant over a period of 30 years, from any new fossil-fueled thermal power plant with a generating capacity of 25 MW or more and existing plants seeking site certification or an order of approval after July 1, 2004. Ecology developed rules for the mitigation of CO_2 from power plants under its jurisdiction. EFSEC is in the process of adopting CO_2 rules consistent with Ecology's, as well as provisions addressing the list of independent qualified organizations and changing the rate that must be paid per ton of CO_2 emissions to be mitigated.

See also Senate Bill 6001 (April 2007), sections 5, 7, 8 and 9, (a weblink to SB6001 is included at the beginning of this document).

1.4 Integrated Resource Planning

Integrated Resource Planning, or IRP, is planning process that strives to meet needs for electricity services in a manner that meets multiple objectives, including evaluation all options, from both the supply and demand sides, in a fair and consistent manner, minimizing costs to all stakeholders, building in flexibility to account for future uncertainties. IRP processes have increasing considered the environmental risks, and the potential costs associated with future regulation of GHGs.

Recently enacted policies in Washington: In 2006, the Legislature passed the Electric Utility Planning Act (ESHB 1010). This Act requires each consumer-owned or investor-owned electric utility with more than 25,000 customers to develop or update an integrated resource plan by September 2008. The resource plan must include, among other requirements:

- an assessment of conservation and efficiency, and recommendations for new policies and programs needed to obtain the conservation and efficiency resources, and
- an assessment and comparative evaluation of renewable and nonrenewable generation.

Plans are reviewed by CTED.

1.5 Voluntary GHG commitments

Numerous US companies and organizations, including many utilities, have taken on voluntary GHG reduction commitments, many through USEPA's Climate Leaders program. These commitments can be based on total GHG emissions in a given year or on an intensity basis (tCO2e per MWh generated or delivered). Some entities with voluntary commitments also engage in the Chicago Climate Exchange (CCX), a self-regulating pilot program for reducing and trading emissions in North America.

1.6 Technology R&D

R&D funding can be targeted toward a particular technology or group of technologies as part of a state program with a mission to build an industry around that technology in the state and/or to set the stage for adoption of the technology for use in the state. For example, an agency can be

established with a mission to help develop and deploy energy storage technologies. R&D funding can also be made available to any renewable or other advanced technology through an open bidding procedure (i.e., driven by bids received rather than by a focused strategy to develop a particular technology). Funding can also be given for demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use. Funding could be provided to increase collaboration between existing institutions for R&D on technologies.

Recently enacted policies in Washington: See Senate Bill 6001 (April 2007), various sections, (a weblink to SB6001 is included at the beginning of this document).

1.7 Cimate Change Education Initiatives

Explicitly articulated education and outreach can support GHG emissions reduction efforts at all levels in the context of emissions reduction programs, policies, or goals. Education and outreach can foster a broad awareness of climate change issues and effects related to Energy Supply (including co-benefits, such as clean air and public health). Such awareness engages citizens both in direct actions to reduce GHG emissions and in support of actions by government, industry or civil society. Education and outreach efforts should integrate with and build upon existing outreach efforts involving climate change and related issues in the state.

ES-2 RENEWABLE ENERGY[1] AND ENERGY EFFICIENCY

2.1 Renewable and/or Environmental Portfolio Standard

A renewable portfolio standard (RPS) is a requirement that utilities must supply a certain percentage of electricity from an eligible renewable energy source(s). For example, an RPS of 5% would mean that for every 100 kilowatt hours (kWh) that a utility or a "load serving entity" (LSE) supplies to end users, 5 kWh must be generated from renewable resources. About 20 states currently have an RPS in place. In some cases, utilities can meet their requirements by purchasing or generating renewable-based electricity or by purchasing renewable energy credits (RECs).

An environmental portfolio standard (EPS) expands the RPS notion to include energy efficiency as an eligible resource as well, exchangeable or not with renewable energy obligations, depending on design. In some cases, utilities can also meet their RPS (or EPS) requirements by purchasing certificates from eligible energy projects, typically referred to as Renewable Energy Certificates (RECs) in the case of RPS policies.

Recently enacted policies in Washington: The 2006 Energy Independence Act (Initiative 937) established renewable portfolio standards. Large utilities (25,000 customers and over) are required to obtain 15% of their electricity from new renewable resources such as solar and wind by 2020 (3% in 2012 -- 9% in 2016 -- and 15% in 2020) and undertake cost-effective energy conservation. The RPS affects 95% of the electric generation in the State.

[1] See attachment at the end for a brief listing of renewable energy projects in the State.

See also Senate Bill 6001 (April 2007), section 4e), (a weblink to SB6001 is included at the beginning of this document).

2.2 Grid-based Renewable Energy Incentives and/or Barrier Removal

This policy option reflects financial incentives to encourage investment in renewable energy sources by businesses that sell power commercially. Financial incentives for grid-based renewables could include, among others: (1) direct subsidies for purchasing/selling distributed renewable technologies given to the buyer/seller (e.g. via a public benefit fund); (2) tax credits or exemptions for purchasing distributed renewable technologies given to the buyer/seller, (3) feed-in tariffs, which provide direct payments to renewable generators for each kWh of electricity generated from a qualifying renewable facility; (4) tax credits for each kWh generated from a qualifying renewable facility; and (5) regulatory policies that provide incentives and/or assurance of cost recovery for utilities that invest in renewable energy systems.

Recently enacted policies in Washington: See 2.3 below. See Senate Bill 6001 (April 2007), section 4d) and 4e), (a weblink to SB6001 is included at the beginning of this document).

2.3 Distributed Renewable Energy Incentives and/or Barrier Removal

This option is focused on renewable energy located on-site at consumer facilities, i.e. on the "customer side of the meter". There are numerous barriers to distributed renewable energy, including inadequate information, institutional barriers, high transaction costs because of small projects, high financing costs because of lender unfamiliarity and perceived risk, "split incentives" between building owners and tenants, and utility-related policies like interconnection requirement, high standby rates, exit fees, etc. The lack of standard offer or long-term contracts, payment at avoided cost levels, and lack of recognition for emissions reduction value provided also creates obstacles. Policies to remove these barriers include: improved interconnection policies, improved rates and fees policies, streamlined permitting, recognition of the emission reduction value, financing packages and bonding programs, power procurement policies, education and outreach, etc.

Note this option may also be considered by the RCI TWG group.

Recently enacted policies in Washington: See also 2.6 below. In 2005, the Legislature enacted the Renewable Energy System Cost Recovery (RCW 82.16.110) and Tax on Manufacturers or Wholesalers of Solar Energy Systems (RCW 82.04.294). The legislation provides incentives for the purchase of locally-made renewable energy products and provides a preferential rate under the business and occupation tax. Furthermore, tax exemptions under RCW 82.08.02567 and RCW 82.12.02567 incent the purchase and use of machinery and equipment used directly to generate electricity using fuel cells, wind, sun, or landfill gas. Similarly, RCW 82.08.835 and RCW 82.12.835 incent the purchase and use of solar hot water systems.

Incentive payments are provided by electric utilities to customers generating renewable energy (i.e., solar, wind) on their property. For example, the Chelan County PUD Sustainable Natural Alternative Power Producers Program encourages customers to install power generators such as

solar panels and wind turbines and connect them to the PUD distribution system; Avista Utilities provides a production credit of 14 cents per KWh for one year; Bonneville Environmental Foundation Green buys "tags" for five cents per KWh for up to five years.

2.4 Green Power Purchases and Marketing

Green power refers to electricity from environmentally-preferred sources such as renewables. These programs allow consumers to purchase "green tags" along with their electricity ensuring that a quantity of electricity equal to their purchase was produced from renewable resources. Government efforts can help to enable such programs, provide incentives or marketing support, or even create purchasing requirements. Several states (e.g. New York, Maryland, and New Jersey) have adopted requirements for fraction of electricity purchased by state agencies that must come from renewable energy sources.

Note this option may also be considered by the RCI TWG group.

Recently enacted policies in Washington: Washington State RCW 19.29A.090 directs larger electric utilities to offer their customers a green power electricity product. See Green Power Programs in Washington: 2006 Report to the Legislature.[2]

2.5 Combined Heat and Power (CHP) and Thermal Energy Recovery and Use Incentives and/or Barrier Removal

Combined heat and power and thermal energy recovery and distribution can reduce GHG emissions by increasing the overall efficiency of fuel use. There are opportunities to recover thermal energy from CHP, waste heat or renewable energy sources. District energy systems provide a key infrastructure for conveying this "recycled" energy from the sources to energy consumers. Key opportunities include:

- recovery ("recycling") of waste heat from power generation (through combined heat and power or CHP),
- recovery (recycle) of waste heat from industrial processes or municipal operations; and
- tapping local renewable resources such as bio-energy, geothermal

However, there are numerous barriers to CHP and thermal energy recovery and use including inadequate information, institutional barriers, high transaction costs because of small projects, high financing costs because of lender unfamiliarity and perceived risk, "split incentives" between building owners and tenants, and utility-related policies like interconnection requirement, high standby rates, exit fees, etc. The lack of standard offer or long-term contracts, payment at avoided cost levels, and lack of recognition for emissions reduction value provided also creates obstacles. Policies to remove these barriers can include:

[2] http://www.cted.wa.gov/DesktopModules/CTEDPublications/CTEDPublicationsView.aspx?tabID=0&ItemID=3909&MId=863&wversion=Staging

1. improved interconnection policies, improved rates and fees policies, streamlined permitting, recognition of the emission reduction value provided by CHP and clean DG, financing packages and bonding programs, power procurement policies, education and outreach, etc.
2. establishing a Washington State inventory of waste heat resources, identifying how much and where waste heat exists, how much of the heat is useable (of high enough quality) and how much is feasible to recover (near enough users of heat);
3. evaluate the full renewable thermal energy potential of the State including a comprehensive assessment of bioenergy resources, the potential to use natural sources of air conditioning from cold deep surface water, and geothermal heating; provision of incentives for new or existing waste heat generators to (re)locate adjacent or close by to heat sinks;
4. provide information/education/outreach programs to address barriers to district energy development, including inadequate information, institutional barriers, lack of integrated community energy planning and lack of financial sector understanding of these systems; provision of financial incentives to implement district energy, waste heat recovery and renewable thermal energy systems through a variety of programs including:
    a. Low-cost bonding or loan guarantee programs;
    b. Incentives for buildings to connect to district energy systems established to use or convert to renewable energy or recover waste energy; and
    c. Incentives to upgrade existing steam district energy systems to hot water district energy distribution to enhance system performance and improve efficiencies.

Other financial incentives for combined heat & power (CHP) could include: (1) direct subsidies for purchasing/selling CHP systems given to the buyer/seller; (2) tax credits or exemptions for purchasing/selling CHP systems given to the buyer/seller; (3) tax credits or exemptions for operating CHP systems; (4) feed-in tariff, which is a direct payment to CHP owners for each kWh of electricity or BTU of heat generated from a qualifying CHP system; and (5) tax credits for each kWh or BTU generated from a qualifying CHP system.

Note this option may also be considered by the RCI TWG group.

Recently enacted policies in Washington: Washington State RCW 82.08.02565 and 82.12.02565 provide tax exemptions for the sale and use of machinery and equipment used for CHP facilities.

2.6 Pricing and metering strategies to promote renewable energy and/or CHP (e.g. net metering)

Pricing and metering strategies can provide consumers with price signals to encourage energy efficiency, CHP, renewable energy, and overall reductions in greenhouse gas emissions. Pricing strategies provide electricity consumers with a greater opportunity to manage their electricity consumption in response to price signals encouraging consumers to adjust demand (e.g. turning

off lighting or appliances when the price reaches a threshold set by the consumer). Net metering is a policy that allows owners of grid-connected distributed generation (generating units on the customer side of the meter, often limited to some maximum kW level) to generate excess electricity and sell it back to the grid, effectively "turning the meter backward."

Pricing strategies can take many forms including:

- real-time pricing in which utility customer rates are not fixed, but reflect the varying costs that utilities themselves pay for power; especially during peak times.
- "time-of-use" rates, which are fixed rates for different times of the day and/or for different seasons;
- "increasing block" rates that are defined by blocks of consumption;
- green pricing whereby customers are given the opportunity to purchase electricity with a renewable or cleaner mix than the standard supply mix offered by the utility; and
- advanced metering to allow electricity consumers much greater opportunity to manage their electricity consumption.

Net metering provides several incentives for renewable DG by reducing transaction costs (e.g., no need to negotiate contracts for the sale of electricity back to the utility) and increasing revenue by setting compensation at retail electricity rates rather than at utility avoided costs.

Recently enacted policies in Washington: In 2006, the Legislature amended the net metering law originally passed in 1998 (HB 2352 amended Chapter 80.60 RCW). The law directs large electric utilities to make net metering available to eligible customers-generators on a first-come, first-served basis until the cumulative generating capacity of net metering systems equals 0.25 percent of the utility's peak demand during 1996. On January 1, 2014, the cumulative generating capacity available to net metering systems will equal 0.5 percent of the utility's peak demand during 1996. Not less than one-half of the utility's 1996 peak demand available for net metering systems shall be reserved for the cumulative generating capacity attributable to net metering systems that generate renewable energy.

2.7 Renewable energy development issues (zoning, siting, etc.)

Policies can be developed to help overcome barriers and increase incentives for renewable energy development. Commercialization and market barriers such as price distortions, failure of the market to value the public benefits of renewables and the social cost of fossil fuel technologies, inadequate information, institutional barriers, high transaction costs because of small projects, high financing costs because of lender unfamiliarity and perceived risk can be overcome through a suite of financial and regulatory incentives for renewable energy development.

Financial incentives can include property tax exemptions, exclusions, and credits; personal income tax credits or deductions to cover the expense of purchasing and installing renewable energy equipment; loan programs to aid in financing the purchase of renewable energy equipment; and grant programs designed for research and development or to help a project achieve commercialization.

Regulatory policies can include solar or wind easements of access rights; development guidelines at the local level to enhance renewable energy generation (e.g. requiring proper street orientation); requirements that utilities provide information and utility leasing programs for renewable energy production to customers in remote regions.

Recently enacted policies in Washington: See Senate Bill 6001 (April 2007), section 4d), (a weblink to SB6001 is included at the beginning of this document).

2.8 Technology-focused initiatives (biomass co-firing, fuel cells, energy storage, etc.)

States can undertake initiatives focused on developing, promoting, and/or implementing one or more specific technologies that show promise for reducing GHG emissions. Technologies could include, among others, fuel cells (to increase efficiency, create markets for hydrogen, etc.), energy storage such as compressed air systems (to enable greater penetration of intermittent renewable technologies such as wind), or biomass co-firing. Biomass co-firing can be a low-cost, near-term means of converting biomass to electricity and displacing coal use by adding up to 15% biomass in high-efficiency coal boilers.

2.9 Efficiency improvements at existing renewable energy plants

Efficiency improvements refer to increasing generation efficiency at generation stations through incremental improvements at existing hydro, biomass or wind plants (e.g., more efficient turbines, improved control systems). Policies to encourage efficiency improvements could include incentives or regulations as described in other options, with adjustments for financing opportunities and efficiency rates of existing plants.

2.10 Using carbon offset markets to promote additional renewable energy

Carbon offsets markets provide an opportunity for entities undertaking actions that reduce GHG emissions to sell the credit for these reductions to other entities (who may be purchasing the reduction credits – or offsets – in order to meet mandatory or voluntary GHG emission reduction goals). Most offsets programs include require participants to prove that the GHG reductions are "additional" reductions (in other words, the actions leading to the GHG reductions would not have occurred for other financial or regulatory reasons). Entities that produce energy from renewable sources, rather than fossil fuel-based sources, can claim carbon offsets (if they meet the Offset Programs requirements). Initiatives to encourage the use of the carbon offsets markets by renewable energy generators include providing additional technical assistance (including bundling several small entities into a single mass of GHG emission reductions) or financial incentives to renewable energy providers.

ES-3 FOSSIL FUEL AND NUCLEAR ELECTRICITY

3.1 Incentives, support and/or requirements for Advanced fossil fuel technologies

3.1 a Advanced Fossil Fuel Generation and Pre-combustion Sequestration Technologies

Advanced fossil technologies include more efficient and thus lower emitting generation technologies. Several advanced fossil technologies, such as Integrated Gasification Combined Cycle (IGCC) power plants, also allow for more cost-effective collection of CO_2 emissions for sequestration. Policies for advanced fossil and pre-combustion technologies may include mandates or incentives to use advanced coal technologies for new coal plants. A mandate might require that new fossil fuel-fired power plants achieve a certain CO_2 emission rate that is only achievable with advanced technology. Alternatively, a mandate might require that all new coal plants be of a certain type, e.g., IGCC. A mandate might also be a requirement that a certain percentage of new coal plants employ IGCC or other advanced fossil technologies. Incentives may be in the form of direct subsidies or assistance in securing financing and/or off-take agreements. A combination of mandates and incentives is also possible.

3.1 b Post-combustion Sequestration Technologies

Technologies for CO2 capture and sequestration (CCS) – either from conventional or gasification power plants – are in early development stages. Policies to encourage CCS could include a state agency or department within an existing agency tasked with promoting CCSR, evaluation studies to identify geologically sound reservoirs, R&D funding to improve CCS technologies, financial incentives to capture and store carbon or to capture and reuse it, and/or mandates to capture and store carbon or capture and reuse it.

Recently enacted policies in Washington: See Senate Bill 6001 (April 2007), section 7, (a weblink to SB6001 is included at the beginning of this document).

3.2 Nuclear power support and/or incentives (e.g. relicensing, uprating)

Nuclear power presents a low-GHG source of electricity. As of the end of last year, there were 104 commercial nuclear generating units, licensed by the U.S. Nuclear Regulatory Commission (NRC) with an electric capability of 97,400 MW. No new commercial reactor has come on line in the US since 1996. The current Administration has been supportive of nuclear expansion, emphasizing its importance in maintaining a diverse energy supply and its potential for producing electricity with negligible greenhouse gas emissions during operation.

Nuclear plant relicensing allows a nuclear power plant to extend the life of the facility for twenty years past its original 40-year license term. The Nuclear Regulatory Commission (NRC), the nation's regulatory authority for nuclear power, considers the relicensing program one of its major cornerstones of current regulatory activity. A nuclear power plant uprating is a process whereby a licensee receives approval from the NRC to operate a plant at a higher power level than the level authorized in the original license.

3.3 Efficiency Improvements and Repowering Existing Plants

Efficiency improvements refer to increasing generation efficiency at power stations through incremental improvements at existing plants (e.g., more efficient boilers and turbines, improved

control systems, or combined cycle technology). Repowering existing power plants refers to switching to lower or zero emitting fuels at existing plants, or for new capacity additions. This includes use of biomass or natural gas in place of coal or oil. Policies to encourage efficiency improvements and repowering of existing plants could include incentives or regulations as described in other options, with adjustments for financing opportunities and emission rates of existing plants.

Recently enacted policies in Washington: See Senate Bill 6001 (April 2007), sections 4c) and 11, (a weblink to SB6001 is included at the beginning of this document).

3.4 Technology-focused initiatives

States can undertake initiatives focused on developing, promoting, and/or implementing one or more specific fossil fuel or nuclear technologies that show promise for reducing GHG emissions. Technologies could include, among others, carbon capture and storage (to sequester carbon dioxide emissions from power plants, oil and gas operations, and/or refineries); biomass blending in coal power plants; implementation of equipment in oil and gas operations that increases efficiency and reduces losses (e.g. remote sensors of leaks).

ES-4 Fuel Production, Processing, and Delivery

4.1 Oil and Gas Production: GHG Emission Reduction Incentives, Support, or Requirements

There are a number of ways in which methane (CH_4) and CO_2 emissions can be reduced in the oil and gas production. Natural gas consists primarily of methane, a potent greenhouse gas; therefore, any reducing leaks during production, processing, and transportation/distribution leads to direct GHG emissions savings. In addition to reducing GHG emissions, stopping these leaks may be economically beneficial because it can prevent the waste of valuable product. The EPA Natural Gas STAR program offers numerous methods of preventing leaks, including preventive maintenance: (improving the overall efficiency of the gas production and distribution system), reducing flashing losses (releases when pressure drops at storage tanks, wells, compressor stations, or gas plants), and changing and replacing parts and devices to reduce leaks and improve efficiency, among others. This option could also include incentives for use of carbon capture and storage (CCSR) technologies during oil and gas production.

4.2 Natural Gas Transmission and Distribution

There are a number of ways in which natural gas emissions during transmission and distribution can be reduced. Natural gas consists primarily of methane, a potent greenhouse gas; therefore, any reduction of leaks during production, processing, and transportation/distribution leads to direct GHG emissions savings. In addition to reducing GHG emissions, stopping these leaks may be economically beneficial because it can prevent the waste of valuable product. The EPA Natural Gas STAR program offers numerous methods of preventing leaks, including preventive

maintenance: (improving the overall efficiency of the gas production and distribution system), reducing flashing losses (releases when pressure drops at storage tanks, wells, compressor stations, or gas plants), and changing and replacing parts and devices to reduce leaks and improve efficiency, among others.

4.3 Oil Refining: GHG Emission Reduction Incentives, Support, or Requirements

There are a number of ways in which CH_4 and CO_2 emissions can be reduced in the production of liquid fuels at oil refineries. These options include various efficiency measures including enhanced combined heat and power along with carbon capture and storage. Regulations, incentives, and/or support programs can be applied to achieve these reductions.

4.4 Coal Production: GHG Emission Reduction Incentives, Support, or Requirements

There are a number of ways in which CH_4 and CO_2 emissions can be reduced in the production of coal. These options include various efficiency measures including enhanced combined heat and power along with carbon capture and storage. Regulations, incentives, and/or support programs can be applied to achieve these reductions.

4.5 Coal-to-Energy Production: GHG Emission Reduction Incentives, Support, or Requirements

4.5 a Coal-to-liquids Production

Coal-to-liquids (CTL) plants are energy-intensive, and produce about 10 times more CO_2 emissions than conventional oil refineries in order to produce liquid fuels; however, with carbon capture and storage (and co-production of electricity and liquid fuels) such emissions can be substantially reduced.[3] Regulations, incentives, and/or support programs can be applied to achieve these reductions.

4.5 b Coal-to-gas Production

Technologies that convert coal-to-syngas are also being considered for alternative energy production for gaseous. These gasification plants are energy-intensive compared with natural gas production but can offer opportunities to capture and store carbon. Regulations, incentives, and/or support programs can be applied to achieve these reductions.

4.6 Low-GHG Hydrogen production incentives and support

Hydrogen is not an energy source, but rather an energy carrier (like electricity). It must be produced from other energy resources, such as fossil fuels (coal, oil, gas), renewable electricity (wind, solar), renewable fuels (biofuels, LFG), or nuclear power. The net greenhouse gas implications of producing hydrogen depend on the energy resource from which it is produced. Hydrogen can be produced from renewable fuels or nuclear energy with low greenhouse gas emissions. In order to produce hydrogen from fossil fuels with low greenhouse gas emissions, it

[3] International Energy Agency, 2006. *Energy Technology Perspectives.* Well-to-wheel GHG emissions from coal liquids are approximately twice those of conventional oil products. Cogeneration and carbon capture and storage can reduce those emissions to levels similar to, or slightly below, those of conventional oil products.

would be necessary to do it in conjunction with CCS. Policies in support of this option would provide incentives to projects that help develop or deploy low-GHG hydrogen production technologies.

4.7 Liquefied Natural Gas Policies and Infrastructure

Improving the infrastructure for LNG imports into Washington State can help reduce GHG emissions in two ways:

1. Policies requiring efficient transportation infrastructure (ports and pipelines) can reduce leaks and improve the energy efficiency of transportation, leading to emission reductions relative to a case with LNG imports and less efficient transportation infrastructure
2. Use of LNG rather than coal or gasoline would lead to emission reductions since LNG has lower carbon intensity per BTU.

In general, the Energy Supply sector would count the emissions reductions from the former but not the latter activities (the emission reduction associated with LNG consumption would be counted under the energy consuming sectors). To the extent that this option leads to increases levels of LNG imports, relative to the reference case, it could lead to increased GHG emissions *in this sector.* The emission reductions in the energy consuming sectors would likely be much greater than the increases to the Energy Supply sector.

However, one of the goals of the CAT process is to reduce fuel imported to Washington State. Any net increases in LNG imports will need to be countered by decreased imports of other fuels.

ES-5 Carbon Capture and Storage or Reuse

5.1 CCSR incentives, requirements, and/or enabling policies (including R&D, administration, regulation, liability, incentives)

Carbon dioxide (CO_2) capture and storage or reuse (CCSR) is a process consisting of the separation of CO_2 from industrial and energy-related sources, transport to a storage location and long-term isolation from the atmosphere. The CO_2 from large point sources can be compressed and transported for storage in geological formations, in the ocean, in mineral carbonates, or for reuse in industrial processes. Captured carbon can be reused for enhanced recovery of oil and gas extraction or as a feedstock for industrial processes. The net reduction of emissions to the atmosphere through CCSR depends on the fraction of CO_2 captured, the increased CO_2 production resulting from loss in overall efficiency of power plants or industrial processes due to the additional energy required for capture, transport and storage, any leakage from transport and the fraction of CO_2 retained in storage over the long term. The most viable of these technologies today appears to be Integrated Gasification Combined Cycle (IGCC) combined with carbon capture and storage and reuse (CCSR) technology. There are also emerging CCSR technologies that show promise for capturing carbon emissions from traditional pulverized coal fired boilers. These emerging technologies include chilled ammonia scrubbing and oxy-fuel combustion. Carbon capture technologies have the potential to remove approximately 90 percent of a coal plant's CO2 emissions.

Technological and financial barriers exist to implementation of CCSR. While separation, capture and transport of CO2 are mature technologies only three industrial-scale storage projects are currently in operation: the Sleipner project in an offshore saline formation in Norway, the Weyburn EOR project in Canada, and the In Salah project in a gas field in Algeria. Further R&D funding to improve CCSR technologies and evaluation studies to identify geologically sound reservoirs will be needed.
Policies to encourage CCSR could include a state agency or department within an existing agency tasked with promoting CCSR, financial incentives to capture and store carbon or to capture and reuse it, and/or mandates – coupled with cost and investment recovery mechanisms, if appropriate – to capture and store carbon or capture and reuse it.

TWG Comments (from May 24, 2007 TWG meeting and individual TWG member submissions)

- Identify potential carbon sequestration reservoirs (permanent geological storage and other permanent capture opportunities)
- CO_2 pipeline transmission issues (from source to reservoir)
- Policies for CO_2 sequestration - including state permitting, issues regarding short and long term liability

Other policy initiatives include:

a. Development of a Comprehensive Legal and Regulatory Framework for CCS.
CCSR raises new legal and regulatory risks associated with siting and permitting projects, CO2 transportation, injection and storage.[4] These risks are not yet fully understood, nor are uniform standards or government regimes in place to address and mitigate them. Among the key questions to be addressed in the development of a consistent regulatory framework for CCSR are: immunity from potentially applicable criminal and civil environmental penalties; property rights, including the passage of title to CO2 (including to the government) during transportation, injection and storage; government-mandated caps on long-term CO2 liability, insurance coverage for short-term CO2 liability; the licensing of CO2 transportation and storage operators, intellectual property rights related to CCS, and monitoring of CO2 storage facilities.

b. Modification of the Traditional Least-Cost/Least Risk Regulatory Standard to Allow Development of CCS-Equipped IGCC and Pulverized Coal Resources.
An option for this is to adopt a "reasonable and necessary" standard for IGCC and CCS technologies used to serve Washington customers, in place of a least cost/least risk standard. Indiana adopted a similar approach, requiring the Indiana Utility Regulatory

[4] Robertson, K., Findsen, J., Messner, S., Science Applications International Corporation. June 23, 2006. "International Carbon Capture and Storage Projects Overcoming Legal Barriers", prepared for the National Energy Technology Laboratory (see http://www.netl.doe.gov/energy-analyses/pubs/CCSregulatorypaperFinalReport.pdf)

Commission to encourage the development of IGCC and CCS as long as it concludes that the projects are reasonable and necessary.[5]

c. Enact Tax Incentives to Help Bridge the Cost Gap Between IGCC and CCSR Technologies and Traditional Uncontrolled Coal.

One effective option for IOU development of IGCC and CCS technologies is a tax credit plus accelerated depreciation.

d. Use Assured, Timely Cost recovery to mitigate the Added Risks and Financing Challenges of IGCC and CCS

The developmental nature of IGCC and CCS technologies creates added risk and cost during the pre-construction phase, in construction of the plant and in the plant's performance.

The added risk and cost create financing challenges for an IGCC or CCS investment. Assured, timely cost recovery, typically achieved by "pay as you go" proposals, can help mitigate these challenges.

Recently enacted policies in Washington: See Senate Bill 6001 (April 2007), section 4b, (a weblink to SB6001 is included at the beginning of this document).

5.2 Research and Development for Carbon Capture Storage or Reuse

R&D for the CCSR technologies is also vital for their larger scale commercialization. R&D funding can also be made available to CCSR technologies through an open bidding procedure (i.e., driven by bids received rather than by a focused strategy to develop a particular technology). Funding can also be given for demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use. Funding could be provided to increase collaboration between existing institutions for R&D on these technologies.

ES-6 Other Energy Supply Options

6.1 Transmission System Access, Planning, and Incentives

Distributed, small-scale and other clean energy technologies for electricity generation often face barriers in accessing the power grid. Since selling excess power to the grid allows these generators to help recoup the costs of the systems, grid access improves the cost-effectiveness of these systems. Initiatives include conditional firm pricing for clean/distributed energy and planning for additional intermittent (wind) generation.

6.2 Improve Transmission and Distribution System Efficiency

There are several energy efficiency measures that can be implemented to reduce the transmission and distribution line losses of electricity. Utilities use a variety of components throughout the

[5] IC 8-1-8.8-11(a), provides that "The Commission shall encourage clean coal and energy projects by creating the following financial incentives for clean coal and energy projects, if the projects are found to be reasonable and necessary."

transmission and distribution system to reduce losses. Increasing the efficiency of these components can further reduce losses. Vermont State, for example, offers a rebate to encourage users to install energy efficient transformers. Regulations, incentives, and/or support programs can be applied to achieve greater efficiency of transmission and distribution system components.

Measures to improve transmission systems to reduce bottlenecks and enhance throughput may be required to satisfy long-term electricity demands. Opportunity exists to increase transmission line carrying capacity as much as threefold through the implementation of new construction and retrofit activities on the transmission grid including incorporating advanced composite conductor technologies, capacitance technologies, and grid management software. Siting new transmission lines can be a difficult process given their cost and their actual or perceived impact on health, environment, and the use, enjoyment, and value of property. Policy measures in support of this option could provide incentives to utilities to upgrade transmission systems and reduce barriers to siting of new transmission lines. This option could also include reductions in use and leakage of SF6 from distribution system transformers, plus efficient transformers and other materials and equipment

6.3 General Distributed Generation Support (Interconnection Rules, Net Metering, etc.)

A standard interconnection rule will ensure that distributed power products meet minimum requirements for performance, safety, and maintenance and will significantly advance the commercialization of these new technologies. Standardized interconnection rules, which are generally developed and administered by a state's public utility commission, establish clear and uniform processes and technical requirements for connecting DG systems to the electric utility grid. Interconnection standards will reduce barriers to connection of DG systems to the grid identified by policy options 2.3, 2.5, and 2.6. Connecting to the grid enables the facility to: a) purchase power from the grid to supply supplemental power as needed, for example, during periods of planned system maintenance, b) sell excess power to the utility, c) maintain grid frequency and voltage stability, as well as utility worker safety. This topic is of particular interest as the Energy Policy Act of 2005 (EPAct 2005) directs states to consider upgrading their standards for interconnecting small generators within one year of enactment. (http://www.epa.gov/chp/pdf/interconnection_factsheet.pdf)

Recently enacted policies in Washington: Chapter 480-180 of the Washington Administrative Code sets uniform interconnection standards for small distributed generation. The Federal Energy Regulation Commission adopted regulations that would govern interconnection standards for large investor-owned utilities.

6.4 Environmental (emissions) Disclosure

Emission disclosure consists of establishing requirements that GHG emitters publish their estimated GHG emissions on a regular (e.g., annual) basis. In addition to emissions, disclosure can also include an accounting of business risks due to climate change, such as assets in danger of weather-related damage, threats to market share, and risks of future regulation. Environmental disclosure allows investors and consumers to have information regarding a firm's GHG

emissions and climate risks so as to better make purchasing and investment decisions. In the case of energy supply, environmental disclosure would take the form of providing consumers with information on carbon emissions per kWh in a form that it would help them make decisions about electricity purchases and consumption. It is effective particularly if coupled with the opportunity for consumers to select their electricity provider.

Recently enacted policies in Washington: In 2001, Washington House Bill 2565 (Fuel Mix Disclosure Law) was enacted which requires retail electricity suppliers in Washington to provide a disclosure label to their retail customers, at least semi-annually. While not requiring "emissions disclosure", the information collected through this bill has allowed Washington to estimate GHG emissions associated with electricity sales.

6.5 Smart Grid

Use of technology to optimize the electricity grid through devices that control electricity demand and supply based on events throughout the grid. Can involve devices that "turn off" non-essential power when demand, and subsequent electricity prices, are high. Also co-ordinate a range of small scale distributed generation (including electric vehicles) and/or intermittent power, such as wind.[6]

[6] climatesolutions.org/pubs/pdfs/Poweringthe**SmartGrid**.pdf

Attachment: Status of renewable electricity projects in Washington State

Renewable projects (not including hydropower and solid biomass) in operation or at a serious planning stage include the following:

- **Wind** energy projects. As of December 31, 2006, Washington State had 818 MW (megawatts) total installed wind capacity. This capacity is the result of seven projects (Stateline Phase I and II, Nine Canyon Phase I and II, Hopkins Ridge, Big Horn, and Wild Horse). There are several proposed projects under consideration by Washington State's Energy Facility Site Evaluation Council (EFSEC) or County governments (Kittitas Valley, Desert Claim and others). According to the American Wind Energy Association, wind energy potential in Washington is estimated at 3,740 MW.

- **Wave and tidal energy.** Preliminary permits were filed with the Federal Energy Regulatory Commission (FERC) in Washington State. Snohomish Public Utility District (PUD) applied to FERC for seven Tidal energy projects with estimated 100 aMW capacity: Deception Pass, Rich Passage, Spieden Channel, Admiralty Inlet, Agate Passage, San Juan Channel, and Guemes Channel. Tacoma Power is sponsoring the Tacoma Narrows Tidal Energy project; an application was submitted to FERC in September 2005. A preliminary permit was issued in February 2006. Tacoma Power and the Electric Power and Research Institute selected Point Evans to install a test generating unit to evaluate the suitability of the site and the impacts of tidal power generation. Other applications were filed for tidal and wave power along the Columbia River, and in Wallapa Bay and Makah Bay. Potential sites have a draft programmatic environmental impact statement to enable leasing of federal waters for renewable energy development. According to EPRI, wave energy potential in four coastal counties (Jefferson, Pacific, Clallam, and Grays Harbor) is about 500 MW.

- **Solar**: Solar panels have been installed on the roof of the newly renovated legislative building, Ecology's Padilla Bay and Manchester lab offices, and in some parks.

- **Biogas:** Biogas is typically produced from feedstocks such as sewage sludge, livestock manure, and wet organic materials. Three anaerobic digester projects were awarded state loans in 2006; the projects are sponsored by the Port of Sunnyside, Tulalip tribes and Mason County, respectively. The projects will convert livestock waste into methane fuel and energy.